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Canopy Arthropods at Fernow Experimental Forest in West Virginia's Allegheny Mountain Section: I. Macrolepidopterous Moths Collected by Blacklight Trap During a Dimilin Impact Study

Linda Butler, Vicki Kondo and Gregory Chrislip

INTRODUCTION

Gypsy moth, *Lymantria dispar* (L.) (Lepidoptera: Lymantriidae) was introduced into North America in 1869 and has now spread over much of the eastern half of the United States. Larval infestations were first found in West Virginia in 1975. Gypsy moth larvae prefer oak foliage. Their capacity to cause defoliation, which may result in tree mortality, has caused gypsy moth to be considered the most serious hardwood defoliator in the eastern United States (Doane and McManus, 1981).

Among the management methods employed against gypsy moth have been aerial applications of insecticides. In recent years the insect growth regulator Dimilin (1-(4 chlorophenyl)-3-(2, b-diflubenzoyl) urea) or diflubenzuron has been applied to thousands of acres of forest land for gypsy moth suppression. It was first used in West Virginia in 1979. While Dimilin is considered to have minimal direct effects on vertebrates, a number of studies have shown impact of Dimilin on non-target terrestrial forest arthropods (Martinat et al., 1988, 1993; Sample et al., 1993; Butler and Kondo, 1993).

In 1989, we began a study to evaluate Dimilin impact on canopy arthropods. The study was conducted at the Fernow Experimental Forest near Parsons, West Virginia, in the Allegheny Mountain section of the state. During the next six years we sampled by means of blacklight traps, pole pruning of foliage and burlap-banded trees. Results of the Dimilin impact study and arthropod diversity in foliage will be presented elsewhere. We present here an evaluation of richness and abundance of macrolepidopterous moths as collected by blacklight trap on four closed watersheds from 1990–1994.

MATERIALS AND METHODS

Study Sites

The Fernow Experimental Forest is located on the unglaciated Allegheny Plateau (latitude 39° 05'N, longitude 79° 41'W). Elevations range from 533 to 1,112 m with rugged topography and slopes of 10 to 60 percent. The Fernow has a mean of 145 frost-free days, a mean annual precipitation of 147 cm and mean temperature of 9° C (Northeastern Forest Experimental Station, 1987). The experimental forest encompasses 1,902 ha and has been divided into a series of watersheds for research purposes (Adams et al., 1993). This study was conducted on watersheds 1, 4, 7 and 13. Data on predominant tree species on watersheds are from Stephenson 1992 (unpublished).

Watershed 1 is 30.11 ha with a NE aspect. It was clearcut to 6 inches DBH (diameter at breast height) in 1957 and 1958. Primary tree species with regard to basal area include sugar maple (*Acer saccharum* Marsh.), white basswood (*Tilia heterophylla* Vent.), beech (*Fagus grandifolia* Ehrh.), black locust (*Robinia pseudoacacia* L.), cucumber magnolia (*Magnolia acuminata* L.) and red oak (*Quercus rubra* L.). The forest floor is covered by herbaceous growth, primarily nettles (*Urtica* spp.).

Watershed 4 is 38.73 ha with an ESE aspect. It was cut heavily from 1905 to 1910 but has not been timbered since that time. Woody shrubs and vines are common, but little herbaceous ground cover is present. Primary tree species include beech, sugar maple, moosewood (*Acer pensylvanicum* L.), tulip-poplar (*Liriodendron tulipifera* L.), red oak, white basswood and cucumber magnolia. In parts of the watershed are dense understories of young black cherry (*Prunus serotina* Ehrh.).

Watershed 7 is 24.23 ha with an E aspect. It is a new growth forest; in places the canopy is dense with little understory vegetation except hayscented fern (*Dennstaedtia punctinlobula* (Michx.) Moore). The watershed was clearcut and maintained barren with herbicides between 1964 and 1969. Tree species include black birch (*Betula lenta* L.), sugar maple, red oak, black cherry, tulip-poplar and blackgum (*Nyssa sylvatica* Marsh.).

Watershed 13 is 14.23 ha with a NNE aspect. It is a relatively mature forest with little understory vegetation. The watershed was cut early in the century and had light selective cutting up to 1960, but no cutting subsequently. Predominant tree species include sugar maple, red oak, tulip-poplar, black cherry, black birch and white basswood.

Arthropod sampling on the Fernow began in 1989 with pole pruning of foliage and banding of trees. Light traps were employed beginning in 1990. On May 16, 1992, Dimilin 4L was applied to watersheds 1 and 13 at a rate of 0.5 oz AI/acre. Light trap sampling continued through mid-August 1994.

One night each week from early or mid-May to early or mid-August (May 7–August 13, 1990; May 1–August 12, 1991; May 11–August 10, 1992; May 10–August 9, 1993; and May 9–August 8, 1994) four blacklight traps were operated on the Fernow, one on each watershed. Trapping occurred for all watersheds on the same nights. Traps were the 8-watt Universal Light Trap (Model 2851 K) from BioQuip Products (Gardena, CA) and were battery-operated and equipped with photoelectric eyes. Traps were operated the same night each week with no attempt being made to avoid nights that were suboptimal for light trapping (cool, full moon, etc.).

Macrolepidopterous moths were identified by comparison with the West Virginia University Arthropod Collection; counts were made for each species. Voucher specimens from the study are deposited in the WVU Arthropod Collection. Species are listed after the checklist given by Hodges et al. (1983).

RESULTS

Over the five years of blacklight trapping 376 species of macrolepidopterous moths representing 13 families were taken from the four Fernow watersheds (Table 1). Families with the most species were the Noctuidae with 196 and Geometridae with 103. Considerable variation occurred in species captured from year to year (Table 1). For example, of the 196 species of Noctuidae taken over five years, only 42 of the species appeared in the traps all five years. Fifty-seven of the 196 noctuids were represented in only one of the five years. Somewhat less variability was seen for the Geometridae where 42 of 103 species were collected every year and only 17 species were represented in a single year (Table 1).

Table 2 lists the 376 species taken during the study. Species are arranged from most to least abundant over the total five-year period; inclusive flight range is given from earliest date of capture to latest date of capture over the five years. The most abundant species were the geometrids *Itame pustularia* (Gn.), *Hydrelia inornata* (Hulst), *Lomographa glomeraria* (Grt.), *Probole amicaria* (H.-S.), *Melanolophia canadaria* (Gn.), *Iridopsis larvaria* (Gn.) and *Euphyia unangulata* (Haw.), the arctiids *Halysidota tessellaris* (J.E. Smith) and *Hypoprepia fucosa* Hbn. and the notodontid *Peridea basitriens* (Wlk.) (Table 2). Despite accounting for 52 percent of all species taken during the study, the noctuids did not make up the most abundant species. *Euplexia benesimilis* McD. was the most abundant noctuid, but its numbers over five years were 10 percent of those of the most abundant geometrid. Forty of the 196 noctuid species collected in the study were represented by a single individual (Table 2).

Other relatively abundant species were the lasiocampid *Malacosoma americanum* (F.), the arctiid *Clemensia albata* Pack., the geometrids *Heterophleps refusaria* (Wlk.), *Campaea perlata* (Gn.), *Hydria prunivorata* (Fgn.) and *Eupithecia herefordaria* C. & S., the drepanid *Drepana arcuata* Wlk., noc-

tuids *Idia rotundalis* (Wlk.), *Polia detracta* (Wlk.), *Bomolocha edictalis* (Wlk.), and *Acronicta ovata* Grt. and the notodontid *Peridea angulosa* (J.E. Smith).

Abundance of many species fluctuated strongly over the years of the study. The most abundant species, *Itame pustularia*, ranged from 452 to 504 in 1991–1992, increased to 1,709 in 1993 and to 4,223 in 1994. The peak catch of *Hydrelia inornata* was in 1991 with 3,532 individuals, with 1994 being the second highest year with 1,354. While two of the *Lomographa* were almost equally abundant during the study (2,876 *L. glomeraria* and 2,301 *L. vestaliata*), there was no clear pattern each year to indicate that they were cycling together or were interfering with each other. *L. glomeraria* was most abundant in 1993 (1,634), while *L. vestaliata* was most abundant in 1994 (841).

No pattern seemed evident regarding the year of greatest abundance for the most abundant species. More *Idia rotundalis* were trapped in 1990 (222) than in any other study year. *Hydrelia inornata, Halysidota tessellaris, Melanolophia canadaria, Iridopsis larvaria, Clemensia albata, Heterophleps refusaria, Drepana arcuata, Euplexia benesimilis*, and *Bomolocha edictalis* were captured in greatest numbers in 1991. While 1992 saw the lowest abundance of trapped moths for many of the most abundant species, *Hydria prunivorata* was most abundant in traps that year (291). The year 1993 was the peak catch year for *Lomographa glomeraria, Peridea basitriens, Malacosoma americanum, Campaea perlata, Polia detracta* and *Eupethecia herefordaria*. For 1994, *Itame pustularia, Lomographa vestaliata, Probole amicaria, Euphyia unangulata, Hypoprepia fucosa, Acronicta ovata* and *Peridea angulosa* were trapped in greatest abundance.

The 21 most abundant species were trapped each year of the study. The geometrid *Eupithecia herefordaria*, the 22nd most abundant species, was represented by 590 individuals in traps during the study, but was not captured at all in 1990.

Relatively little year-to-year fluctuation in light-trap capture was seen in abundance of some moth species, for example, *Peridea basitriens, Idia rotundalis* and the notodontid *Nadata gibbosa* (J.E. Smith).

The inclusive flight range given for each species reflects the limitation of the current study. Traps were operated only from early or mid-May to early or mid-August each year. Many species began flying before and/or continued flying after those dates.

Variation in length of flight season among species reflects varying degrees of synchrony of adult emergence, differences in adult longevity, effect of multivoltine versus univoltine species and population levels of the different species. Bi- or multivoltine species include *Melanolophia canadaria, Lomographa vestaliata, L. glomeraria, Campaea perlata, Probole amicaria, Iridopsis larvaria, Euphyia unangulata, Peridea basitriens* and *Drepana arcuata*. Flight ranges for *Halysidota tessellaris* and *Malacosoma americanum* are examples of univoltine

species. *Halysidota tesselaris* shows a relative lack of synchrony in adult emergence as reflected in the broad flight ranges, while adult emergence in *M. americanum* is relatively synchronized.

DISCUSSION

Trapping of 376 species of macrolepidopterous moths from early or mid-May through early or mid-August over a period of five years indicates a high level of diversity in the Fernow Experimental Forest. While four traps were operated simultaneously on four different watersheds, all watersheds were relatively small, ranging in size from 14 to 30 ha, and they were relatively similar in vegetation composition. Had traps been operated over a long portion of the season, for example, from March to November, additional moth species may have been collected.

During a simultaneous study of macrolepidopterous larvae on foliage of four tree species groups, commonly collected larvae whose adults fly at times not sampled by the light traps included *Erannis tiliaria* Harr. and *Alsophila pometaria* Harr., whose females are wingless and whose males fly in the fall, *Epiglaea decliva* Grt., a fall flying moth, and *Phigalia titea*, whose females are flightless and whose males fly in early spring (Butler et al. 1995).

Species of moths that develop as larvae on host plants unrepresented or poorly represented in the study watersheds were not collected or were in very low abundance in this study. For example, *Catocala palaeogama* Gn. and *C. residua* Grt. feed exclusively on hickory as larvae. Virtually no hickory was located in the study sites; only one individual of each species was taken during the five-year study.

In an earlier baseline study of macrolepidopterous moths blacklight-trapped at Coopers Rock State Forest, West Virginia (Butler and Kondo 1991), 400 species were collected in a single trap at one location from 1984 to 1986. There were several differences between the two studies. At Coopers Rock, a single 15-watt trap was used at a single site rather than 8-watt traps at four adjacent watersheds. The Coopers Rock trap was operated for approximately 30 weeks each year for three years, whereas the Fernow traps were in operation for five years, but only for 15 weeks each year. In addition, the Fernow traps were operated the same night each week (Monday) regardless of expected weather conditions, whereas the Coopers Rock trap nights, although about at 7-day intervals, were chosen to avoid unseasonably low temperatures when possible, thus likely increasing catch abundance and diversity.

Many similarities were seen between the results of the Coopers Rock and current studies. In the earlier study the most abundant species were also the geometrids *Itame pustularia*, *Probole amicaria*, *Lomographa glomeraria* and *Melanolophia canadaria*; *Campaea perlata* was also relatively abundant but

Hydrelia inornata (second in abundance at Fernow) was relatively less abundant. Other abundant species at Coopers Rock included *Halysidota tesselaris*, *Clemensia albata* and *Malacosoma americanum*, again, similar to current results. However, some noctuids and notodontids were relatively more abundant at Coopers Rock than at Fernow; these include *Orthodes cynica* (Gn.), *Idia aemula* Hbn., *Zanclognatha ochreipennis* (Grt.), *Nadata gibbosa* (J.E. Smith), *Heterocampa guttivitta* (Wlk.) and *Peridea angulosa* (J.E. Smith).

The degree of year-to-year fluctuation in moth species richness was similar between the two studies; again the greatest fluctuation occurred for the Noctuidae.

Most of the differences in species richness between the two studies is attributable to the longer trapping season at Coopers Rock providing species not captured at Fernow; for example, *Paleacrita vernata* (Peck), *P. merriccata* Dyar, *Phigalia titea* (Cram.), *Pyreferra citrombra* Franc., *Eutolype rolandi* Grt., *Copipanolis styracis* (Gn.), and *Psaphida thaxteriana* (Grt.), which fly in early spring (March, April). Species such as *Erannis tiliaria*, *Ennomos magnaria* Gn., *Tolype velleda* (Stoll), *Anticarsia gemmatalis* Hbn., *Papaipema* spp., *Epiglaea decliva*, *Chaetaglaea sericea* (Morr.) and *Eucirroedia pampina* (Gn.) fly in October and November and thus were not taken at Fernow. Some species, particularly *Lithophane* spp., fly from the fall and winter into early spring and were poorly represented in the Fernow traps.

Several species were taken at Fernow but not at Coopers Rock. *Meganola spodia* Franc. is common in more eastern areas of West Virginia (Butler 1989). Only seven *M. spodia* were taken at Fernow, all in 1991; the species has not been taken at Coopers Rock. *Eupithecia herefordaria* was not recorded at Coopers Rock, possibly because of misidentification with *E. miserulata* Grt. *Sicya macularia* (Harr.), *Itame subcessaria* (Wlk.), *Cosmia calami* (Harr.), *Pyrrhia umbra* (Hufn.), *Pyrrhia exprimens* (Wlk.), *Oruza albocostaliata* (Pack.), *Lithophane querquera* Grt., *Eupsilia vinulenta* (Grt.) and *Orthosia revicta* (Morr.) are examples of Fernow species not taken at Coopers Rock.

Light traps have once again shown their value in facilitating a study of richness and abundance of forest macrolepidoptera.

SUMMARY

Macrolepidopterous moths were sampled from four adjacent watersheds at Fernow Experimental Forest from 1990 to 1994. Each year, four 8-watt blacklight traps were operated from early or mid-May to early or mid-August and resulted in the catch of 376 species of macrolepidopterous moths from 13 families over the five-year study. Yearly fluctuation was considerable for many species.

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TABLE 1.

Number of species of Macrolepidoptera in all families taken by blacklight traps at the Fernow Experimental Forest, West Virginia during any one, two, three, four and five years of the study (1990–1994).

	Number of Species Trapped During a Given Number of Years					TOTAL SPECIES
FAMILY	1	2	3	4	5	
THYATIRIDAE	0	0	0	1	2	3
DREPANIDAE	0	0	1	0	1	2
GEOMETRIDAE	17	8	14	22	42	103
EPIPLEMIDAE	0	1	0	0	0	1
MIMALLONIDAE	1	0	0	1	0	2
APATELODIDAE	0	0	1	0	1	2
LASIOCAMPIDAE	0	1	0	1	2	4
SATURNIIDAE	0	1	0	1	3	5
SPHINGIDAE	2	0	0	1	5	8
NOTODONTIDAE	4	2	4	5	13	28
ARCTIIDAE	3	3	2	3	6	17
LYMANTRIIDAE	0	1	0	1	3	5
NOCTUIDAE	57	38	30	29	42	196
TOTAL SPECIES	84	55	52	65	120	376

TABLE 2.

Macrolepidoptera species collected by blacklight trap at the Fernow Experimental Forest, West Virginia during 1990–1994. Species are listed from most to least abundant; inclusive flight range during the five-year period is given.

Species	Family*	1990	1991	1992	1993	1994	Total	Inclusive Flight Range
Itame pustularia (Gn.)	GEO	452	467	504	1709	4223	7355	17JUN–13AUG
Hydrelia inornata (Hulst)	GEO	421	3532	106	994	1354	6407	01MAY–12AUG
Lomographa glomeraria (Grt.)	GEO	596	437	207	1634	2	2876	01MAY–13JUL
Lomographa vestaliata (Gn.)	GEO	139	564	67	690	841	2301	10MAY–16JUL
Halysidota tessellaris (J.E. Smith)	ARC	275	1172	232	163	404	2246	28MAY–10AUG
Probole amicaria (H.-S.)	GEO	85	421	99	592	836	2033	01MAY–13AUG
Melanolophia canadaria (Gn.)	GEO	206	1085	147	188	336	1962	01MAY–13AUG
Iridopsis larvaria (Gn.)	GEO	303	939	9	62	263	1576	01MAY–13AUG
Euphyia unangulata (Haw.)	GEO	263	302	74	275	323	1237	01MAY–13AUG
Hypoprepia fucosa Hbn.	ARC	318	211	76	136	350	1091	01JUL–13AUG

continued

Species	Family*	1990	1991	1992	1993	1994	Total	Inclusive Flight Range
Peridea basitriens (Wlk.)	NOT	233	134	182	315	158	1022	13MAY–13AUG
Malacosoma americanum (F.)	LAS	73	61	32	212	495	873	06JUN–20JUL
Clemensia albata Pack.	ARC	51	552	62	73	35	773	11MAY–13AUG
Heterophleps refusaria (Wlk.)	GEO	107	445	74	65	76	767	06MAY–12AUG
Campaea perlata (Gn.)	GEO	103	158	42	248	201	752	20MAY–13AUG
Drepana arcuata Wlk.	DRE	115	368	5	84	148	720	01MAY–13AUG
Euplexia benesimilis McD.	NOC	100	498	22	39	41	700	10MAY–13AUG
Idia rotundalis (Wlk.)	NOC	222	73	92	118	150	655	10JUN–13AUG
Polia detracta (Wlk.)	NOC	80	171	88	199	94	632	28MAY–13JUL
Hydria prunivorata (Fgn.)	GEO	5	229	291	59	16	600	11MAY–13AUG
Bomolocha edictalis (Wlk.)	NOC	46	217	42	183	107	595	17JUN–13AUG
Eupithecia herefordaria C. & S.	GEO	0	117	14	380	79	590	10MAY–12AUG
Acronicta ovata Grt.	NOC	30	90	8	123	290	541	28MAY–13AUG
Peridea angulosa (J.E. Smith)	NOT	148	35	103	50	199	535	11JUN–13AUG
Chytolita morbidalis (Gn.)	NOC	52	96	79	151	102	480	20MAY–13JUL
Hyphantria cunea (Drury)	ARC	4	60	39	81	284	468	10MAY–06JUL
Heterocampa guttivitta (Wlk.)	NOT	102	178	0	78	82	440	10MAY–09AUG
Semiothisa aemulataria (Wlk.)	GEO	22	370	8	25	8	433	01MAY–12AUG
Orthodes cynica (Gn.)	NOC	0	137	45	80	153	415	20MAY–09AUG
Dryocampa rubicunda (F.)	SAT	15	129	20	134	104	402	10MAY–10AUG
Zanclognatha laevigata (Grt.)	NOC	161	65	26	84	53	389	07JUN–13AUG
Semiothisa ocellinata (Gn.)	GEO	115	130	15	63	64	387	10MAY–13AUG
Nadata gibbosa (J.E. Smith)	NOT	97	65	40	95	85	382	13MAY–13AUG
Idia aemula Hbn.	NOC	38	66	17	100	158	379	24MAY–13AUG
Paonias myops (J.E. Smith)	SPH	36	105	34	126	73	374	10MAY–13AUG
Zale unilineata (Grt.)	NOC	15	30	17	93	183	338	01MAY–15JUN
Zanclognatha ochreipennis (Grt.)	NOC	81	23	11	139	67	321	14JUN–13AUG
Besma endropiaria (G. & R.)	GEO	69	97	0	79	75	320	20MAY–12AUG
Paonias excaecatus (J.E. Smith)	SPH	24	54	37	133	62	310	20MAY–10AUG
Malacosoma disstria Hbn.	LAS	84	58	25	51	90	308	17JUN–20JUL
Morrisonia confusa (Hbn.)	NOC	15	32	13	151	85	296	01MAY–14JUN
Oligocentria semirufescens (Wlk.)	NOT	33	67	18	124	51	293	03JUN–13AUG
Scopula limboundata (Haw.)	GEO	53	73	50	60	53	289	03JUN–08AUG
Semiothisa pinistrobata Fgn.	GEO	107	162	0	6	0	275	13MAY–13AUG
Zale minerea (Gn.)	NOC	17	23	34	129	72	275	01MAY–06AUG
Hypagyrtis unipunctata (Haw.)	GEO	10	116	13	99	30	268	28MAY–12AUG
Aethalura intertexta (Wlk.)	GEO	2	81	121	49	14	267	11MAY–03AUG
Meganola minuscula (Zell.)	NOC	30	76	1	159	0	266	01MAY–12AUG
Eugonobapta nivosaria (Gn.)	GEO	17	51	35	94	36	233	17JUN–08AUG
Symmerista leucitys Franc.	NOT	0	0	12	91	123	226	06JUN–27JUL
Acronicta hasta Gn.	NOC	44	41	6	79	55	225	01MAY–13AUG

continued

*GEO=Geometridae, ARC=Arctiidae, NOT=Notodontidae, LAS=Lasiocampidae, DRE=Drepanidae, NOC=Noctuidae, SAT=Saturniidae, SPH=Sphingidae, LYM=Lymantriidae, EPT=Epiplemidae, THY=Thyatiridae, APA=Apatelodidae, MIM=Mimallonidae

Species	Family*	1990	1991	1992	1993	1994	Total	Inclusive Flight Range
Heliomata cycladata G. & R.	GEO	7	37	1	70	109	224	11MAY–12JUL
Plagodis serinaria H.-S.	GEO	13	56	1	40	109	219	13MAY–29JUN
Bomolocha sordidula (Grt.)	NOC	4	187	1	14	8	214	01MAY–12AUG
Besma quercivoraria (Gn.)	GEO	26	129	6	20	27	208	01MAY–13AUG
Renia sobrialis (Wlk.)	NOC	67	87	0	39	12	205	17JUN–12AUG
Homochlodes disconventa (Wlk.)	GEO	22	48	10	51	59	190	09MAY–12AUG
Cabera erythemaria Gn.	GEO	9	69	16	43	45	182	10MAY–12AUG
Lochmaeus manteo Doubleday	NOT	37	65	28	27	25	182	18MAY–13AUG
Bomolocha baltimoralis (Gn.)	NOC	51	70	1	39	21	182	07MAY–13AUG
Eudryas grata (F.)	NOC	34	72	16	23	23	168	03JUN–10AUG
Polia latex (Gn.)	NOC	33	64	6	39	18	160	10MAY–02AUG
Heterocampa biundata Wlk.	NOT	35	63	10	20	28	156	28MAY–13AUG
Lymantria dispar (L.)	LYM	14	16	37	38	45	150	04JUL–13AUG
Pangrapta decoralis Hbn.	NOC	4	85	18	29	14	150	28MAY–09AUG
Symmerista albifrons (J.E. Smith)	NOT	13	133	0	0	0	146	28MAY–23JUL
Heterophleps triguttaria H.-S.	GEO	9	92	7	29	8	145	13MAY–13AUG
Zanclognatha lituralis (Hbn.)	NOC	65	8	39	17	14	143	07JUN–03AUG
Lithacodia carneola (Gn.)	NOC	13	65	0	32	28	138	13MAY–12AUG
Callopistria mollissima (Gn.)	NOC	24	64	2	17	30	137	13MAY–13AUG
Hydriomena divisaria (Wlk.)	GEO	8	30	0	88	10	136	01MAY–04JUL
Acronicta fragilis Gn.	NOC	41	82	0	2	8	133	10MAY–23JUL
Pero honestaria (Wlk.)	GEO	31	11	11	28	44	125	01MAY–13AUG
Biston betularia (L.)	GEO	22	53	1	5	41	122	13MAY–13AUG
Lambdina pellucidaria (G. & R.)	GEO	17	72	10	19	4	122	06MAY–08AUG
Acronicta haesitata (Grt.)	NOC	7	44	1	14	56	122	20MAY–08AUG
Anavitrinella pampinaria (Gn.)	GEO	37	2	0	20	58	117	17JUN–09AUG
Tetracis cachexiata Gn.	GEO	6	61	6	19	20	112	13MAY–20JUL
Lytrosis unitaria (H.-S.)	GEO	4	41	10	15	40	110	10JUN–03AUG
Polia nimbosa (Gn.)	NOC	3	22	3	42	40	110	17JUN–01AUG
Lophocampa caryae Harr.	ARC	13	66	2	8	17	106	13MAY–25JUN
Idia americalis (Gn.)	NOC	5	19	24	46	11	105	24MAY–13AUG
Dasylophia thyatiroides (Wlk.)	NOT	3	98	0	0	0	101	20MAY–13AUG
Epimecis hortaria (F.)	GEO	10	28	8	49	4	99	10MAY–09AUG
Acronicta innotata Gn.	NOC	16	38	1	12	31	98	21MAY–08AUG
Cladara atroliturata (Wlk.)	GEO	37	44	0	16	0	97	01MAY–03JUN
Anorthodes tarda (Gn.)	NOC	17	7	3	60	10	97	13MAY–20JUL
Macrurocampa marthesia (Cram.)	NOT	14	34	20	16	12	96	24JUN–09AUG
Eulithis diversilineata (Hbn.)	GEO	13	26	3	38	14	94	17JUN–13AUG
Anagoga occiduaria (Wlk.)	GEO	7	32	3	40	11	93	01MAY–13AUG
Pero morrisonaria (Hy. Edw.)	GEO	14	47	1	26	0	88	14MAY–12AUG
Dasylophia anguina (J.E. Smith)	NOT	8	11	2	9	55	85	11MAY–09AUG

continued

Species	Family*	1990	1991	1992	1993	1994	Total	Inclusive Flight Range
Orthonama centrostrigaria (Woll.)	GEO	9	36	16	20	2	83	11MAY–13AUG
Acronicta inclara Sm.	NOC	19	27	1	17	19	83	28MAY–27JUL
Xestia dolosa Franc.	NOC	30	22	2	17	12	83	10MAY–30JUL
Trichodezia albovittata (Gn.)	GEO	0	44	4	32	2	82	01MAY–12AUG
Dasychira basiflava (Pack.)	LYM	33	13	0	18	16	80	17JUN–13AUG
Orthodes crenulata (Butler)	NOC	61	15	0	0	0	76	21MAY–30JUL
Dasychira dorsipennata (B. & McD.)	LYM	9	36	4	23	2	74	10JUN–13AUG
Orthosia rubescens (Wlk.)	NOC	26	17	6	25	0	74	07MAY–14MAY
Bomolocha deceptalis (Wlk.)	NOC	26	33	1	4	7	71	01MAY–13AUG
Antheraea polyphemus (Cram.)	SAT	5	31	4	21	9	70	24MAY–30JUL
Lithacodia muscosula (Gn.)	NOC	0	65	0	1	1	67	03JUN–22JUL
Crociographa normani (Grt.)	NOC	19	7	1	27	13	67	06MAY–06JUN
Eupithecia miserulata Grt.	GEO	59	5	0	0	0	64	14MAY–06AUG
Orgyia leucostigma (J.E. Smith)	LYM	17	15	2	2	28	64	17JUN–13AUG
Platysenta vecors (Gn.)	NOC	16	29	2	10	5	62	01MAY–13AUG
Dysstroma hersiliata (Gn.)	GEO	5	26	9	15	4	59	28MAY–06JUL
Calledapteryx dryopterata Grt.	EPI	4	55	0	0	0	59	28MAY–13AUG
Idia scobialis (Grt.)	NOC	26	5	14	14	0	59	28MAY–13AUG
Cissusa spadix (Cram.)	NOC	4	1	2	50	0	57	01MAY–17MAY
Polygrammate hebraeicum Hbn.	NOC	3	15	0	1	37	56	28MAY–18JUL
Acronicta americana (Harr.)	NOC	12	3	7	21	12	55	17MAY–26JUL
Nemoria bistriaria Hbn.	GEO	0	26	5	19	4	54	10MAY–09AUG
Catocala ultronia (Hbn.)	NOC	6	16	1	21	10	54	08JUL–13AUG
Baileya ophthalmica (Gn.)	NOC	10	8	2	18	16	54	10MAY–09JUL
Acronicta increta Morr.	NOC	19	34	0	0	1	54	10JUN–15JUL
Euparthenos nubilis (Hbn.)	NOC	12	8	4	11	17	52	13MAY–12AUG
Acronicta modica Wlk.	NOC	3	49	0	0	0	52	03JUN–30JUL
Plagodis alcoolaria (Gn.)	GEO	8	10	2	14	17	51	10MAY–15JUL
Cladara limitaria (Wlk.)	GEO	0	11	11	29	0	51	01MAY–18MAY
Pseudothyatira cymatophoroides (Gn.)	THY	3	21	3	12	10	49	28MAY–12AUG
Phalaenostola larentioides Grt.	NOC	15	34	0	0	0	49	13MAY–13AUG
Automeris io (F.)	SAT	1	38	1	6	2	48	28MAY–04JUL
Schizura ipomoeae Doubleday	NOT	4	7	3	5	29	48	24JUN–08AUG
Colocasia propinquilinea (Grt.)	NOC	0	11	3	16	18	48	10MAY–08AUG
Haploa lecontei (Guer.-Meneville)	ARC	0	8	1	20	18	47	10JUN–19JUL
Hypena humuli Harr.	NOC	9	25	0	8	1	43	10MAY–13AUG
Diarsia jucunda (Wlk.)	NOC	6	5	14	12	6	43	28JUN–10AUG
Nola triquetrana (Fitch)	NOC	0	38	2	0	2	42	01MAY–01AUG

continued

*GEO=Geometridae, ARC=Arctiidae, NOT=Notodontidae, LAS=Lasiocampidae, DRE=Drepanidae, NOC=Noctuidae, SAT=Saturniidae, SPH=Sphingidae, LYM=Lymantriidae, EPT=Epiplemidae, THY=Thyatiridae, APA=Apatelodidae, MIM=Mimallonidae

Species	Family*	1990	1991	1992	1993	1994	Total	Inclusive Flight Range
Eutrapela clemataria (J.E. Smith)	GEO	3	2	5	30	1	41	10MAY–06AUG
Pyrrharctia isabella (J.E. Smith)	ARC	10	26	0	2	2	40	14MAY–06AUG
Hyperaeschra georgica (H.-S.)	NOT	6	7	0	19	6	38	07MAY–08AUG
Phalaenophana pyramusalis (Wlk.)	NOC	20	18	0	0	0	38	03JUN–06AUG
Zanclognatha pedipilalis (Gn.)	NOC	2	1	16	19	0	38	16JUL–09AUG
Balsa labecula (Grt.)	NOC	8	15	4	0	11	38	13MAY–30JUL
Plagodis phlogosaria (Gn.)	GEO	7	5	2	20	3	37	10MAY–10AUG
Prochoerodes transversata (Drury)	GEO	14	5	10	0	8	37	24JUN–13AUG
Cyclophora pendulinaria (Gn.)	GEO	0	7	4	25	1	37	10MAY–12AUG
Heterocampa umbrata Wlk.	NOT	7	22	1	1	6	37	13MAY–08AUG
Peridea ferruginea (Pack.)	NOT	5	1	1	14	15	36	30MAY–08AUG
Plathypena scabra (F.)	NOC	6	10	1	10	9	36	30MAY–12AUG
Ennomos subsignaria (Hbn.)	GEO	19	9	7	0	0	35	15JUN–13AUG
Epirrhoe alternata (Müller)	GEO	5	6	0	0	24	35	07MAY–30JUL
Habrosyne scripta (Gosse)	THY	2	13	1	12	6	34	13MAY–12AUG
Ectropis crepuscularia (D. & S.)	GEO	15	17	0	2	0	34	01MAY–12JUL
Metarranthis hypocharia (H.-S.)	GEO	0	3	3	10	18	34	24MAY–06JUL
Eubaphe mendica (Wlk.)	GEO	0	11	8	4	11	34	03JUN–20JUL
Idia diminuendis (B. & McD.)	NOC	13	9	4	8	0	34	08JUL–09AUG
Apatelodes torrefacta (J.E. Smith)	APA	3	13	4	6	5	31	10JUN–03AUG
Achatia distincta Hbn.	NOC	2	1	2	21	5	31	07MAY–30MAY
Pleuroprucha insularia (Gn.)	GEO	0	30	0	0	0	30	03JUN–12AUG
Dyspteris abortivaria (H.-S.)	GEO	7	10	2	0	11	30	14MAY–06AUG
Parallelia bistriaris Hbn.	NOC	3	8	2	15	2	30	24MAY–09AUG
Acronicta tristis Sm.	NOC	0	3	0	27	0	30	03JUN–12JUL
Cerma cerintha (Tr.)	NOC	6	6	0	1	16	29	03JUN–16JUL
Euchlaena obtusaria (Hbn.)	GEO	17	7	0	3	1	28	10JUN–21JUN
Oligocentria lignicolor (Wlk.)	NOT	4	8	1	12	3	28	10JUN–09AUG
Catocala blandula Hulst	NOC	0	5	4	19	0	28	24JUN–10AUG
Balsa malana (Fitch)	NOC	6	0	0	22	0	28	10MAY–02AUG
Glena cribrataria (Gn.)	GEO	2	24	1	0	0	27	20MAY–08JUL
Acronicta spinigera Gn.	NOC	1	22	0	4	0	27	17MAY–12AUG
Lithophane semiusta Grt.	NOC	27	0	0	0	0	27	07MAY–21MAY
Heterocampa obliqua Pack.	NOT	0	1	0	6	19	26	06JUN–05AUG
Nematocampa limbata (Haw.)	GEO	2	6	1	8	8	25	17JUN–09AUG
Lithophane hemina Grt.	NOC	0	15	0	10	0	25	10MAY–13MAY
Agrotis ipsilon (Hufn.)	NOC	4	5	0	7	9	25	13MAY–09AUG
Olceclostera angelica (Grt.)	APA	5	18	0	1	0	24	17JUN–16JUL
Dasychira obliquata (G. & R.)	LYM	0	13	0	0	11	24	04JUL–12AUG
Abagrotis alternata (Grt.)	NOC	9	11	4	0	0	24	01JUL–12AUG

continued

Species	Family*	1990	1991	1992	1993	1994	Total	Inclusive Flight Range
Protoboarmia porcelaria (Gn.)	GEO	3	19	0	0	1	23	13JUN–13AUG
Catocala micronympha Gn.	NOC	13	3	0	0	7	23	04JUL–13AUG
Acronicta morula G. & R.	NOC	0	3	0	1	19	23	10MAY–01AUG
Pseudorthodes vecors (Gn.)	NOC	18	1	3	1	0	23	09JUL–06AUG
Lomographa semiclarata (Wlk.)	GEO	2	2	4	14	0	22	01MAY–07JUN
Nacophora quernaria (J.E. Smith)	GEO	3	8	2	3	5	21	10MAY–16JUL
Sicya macularia (Harr.)	GEO	2	7	3	6	3	21	21JUN–20JUL
Euthyatira pudens (Gn.)	THY	13	5	1	1	0	20	01MAY–21MAY
Orthonama obstipata (F.)	GEO	1	13	1	5	0	20	24MAY–27JUL
Amphipyra pyramidoides Gn.	NOC	2	0	0	5	12	19	26JUL–13AUG
Pseudaletia unipuncta (Haw.)	NOC	6	0	6	4	3	19	29MAY–13AUG
Caripeta divisata Wlk.	GEO	0	4	5	8	1	18	05JUL–12AUG
Thioptera nigrofimbria (Gn.)	NOC	1	16	0	1	0	18	03JUN–13AUG
Chytonix palliatricula (Gn.)	NOC	1	3	0	5	9	18	28MAY–23JUL
Itame subcessaria (Wlk.)	GEO	4	1	0	7	5	17	28JUN–18JUL
Actias luna (L.)	SAT	0	7	1	4	5	17	01MAY–01AUG
Esophoropteryx thyatyroides (Gn.)	NOC	6	3	1	5	2	17	28JUN–13AUG
Elaphria festivoides (Gn.)	NOC	2	7	1	4	3	17	24MAY–02JUL
Ochropleura plecta (L.)	NOC	0	10	0	5	2	17	06MAY–12AUG
Euchlaena tigrinaria (Gn.)	GEO	3	12	0	1	0	16	03JUN–18JUN
Callosamia angulifera (Wlk.)	SAT	1	15	0	0	0	16	17JUN–16JUL
Ecliptopera atricolorata (G. & R.)	GEO	5	6	1	2	1	15	01JUL–30JUL
Anagrapha falcifera (Kby.)	NOC	1	6	2	6	0	15	13MAY–26JUL
Hyperstrotia pervertens (B. & McD.)	NOC	1	14	0	0	0	15	10JUN–23JUL
Oligia modica (Gn.)	NOC	6	9	0	0	0	15	08JUL–13AUG
Phosphila miselioides (Gn.)	NOC	0	2	0	6	7	15	10MAY–12AUG
Egira alternans (Wlk.)	NOC	4	4	0	2	5	15	01MAY–30MAY
Laothoe juglandis (J.E. Smith)	SPH	2	1	1	8	2	14	28MAY–20JUL
Lithacodia synochitis (G. & R.)	NOC	1	13	0	0	0	14	10JUN–22JUL
Acronicta impleta Wlk.	NOC	0	1	1	0	12	14	23MAY–08AUG
Plagodis fervidaria (H.-S.)	GEO	6	1	0	0	6	13	14MAY–08AUG
Tetracis crocallata Gn.	GEO	2	6	1	2	2	13	13JUN–20JUL
Xanthorhoe ferrugata (Cl.)	GEO	1	12	0	0	0	13	13MAY–09JUL
Darapsa myron (Cram.)	SPH	3	4	2	2	2	13	10JUN–27JUL
Zale lunifera (Hbn.)	NOC	2	11	0	0	0	13	01MAY–14MAY
Phlogophora iris Gn.	NOC	1	4	1	3	4	13	21MAY–05JUL
Feralia comstocki (Grt.)	NOC	0	5	2	6	0	13	10MAY–13MAY
Orthosia hibisci (Gn.)	NOC	0	6	7	0	0	13	01MAY–18MAY
Semiothisa ulsterata (Pears.)	GEO	0	0	0	0	12	12	30MAY–08AUG

continued

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Species	Family*	1990	1991	1992	1993	1994	Total	Inclusive Flight Range
Ceratomia undulosa (Wlk.)	SPH	1	1	2	6	2	12	17MAY–01AUG
Acronicta interrupta Gn.	NOC	11	1	0	0	0	12	17JUN–13AUG
Elaphria chalcedonia (Hbn.)	NOC	1	11	0	0	0	12	28MAY–13AUG
Anticlea vasiliata Gn.	GEO	0	1	0	9	1	11	01MAY–30MAY
Deidamia inscripta (Harr.)	SPH	2	0	1	3	5	11	11MAY–06JUN
Scolecocampa liburna (Gey.)	NOC	0	0	4	7	0	11	19JUL–27JUL
Panopoda rufimargo (Hbn.)	NOC	1	5	0	2	3	11	14JUN–12JUL
Cicinnus melsheimeri (Harr.)	MIM	0	2	1	2	5	10	28MAY–29JUN
Haploa contigua (Wlk.)	ARC	0	0	6	4	0	10	12JUL–20JUL
Renia discoloralis Gn.	NOC	0	3	4	3	0	10	17JUN–09AUG
Palthis angulalis (Hbn.)	NOC	0	3	1	5	1	10	13MAY–09AUG
Catocala ilia (Cram.)	NOC	1	0	0	7	2	10	12JUL–09AUG
Charadra deridens (Gn.)	NOC	5	3	0	1	1	10	13MAY–13AUG
Achatodes zeae (Harr.)	NOC	4	1	2	2	1	10	08JUL–08AUG
Lacinipolia renigera (Steph.)	NOC	5	1	2	2	0	10	01JUN–30JUL
Homorthodes furfurata (Grt.)	NOC	0	3	0	5	2	10	24JUN–09AUG
Metanema inatomaria (Gn.)	GEO	2	1	1	0	5	9	30MAY–01AUG
Cepphis armataria (H. & S.)	GEO	0	4	1	1	3	9	03JUN–20JUL
Lambdina fervidaria (Hbn.)	GEO	3	0	0	6	0	9	26JUL–13AUG
Xanthorhoe lacustrata (Gn.)	GEO	0	9	0	0	0	9	28MAY–10JUN
Spilosoma latipennis Strech	ARC	2	2	1	3	1	9	29MAY–23JUL
Catocala amica (Hbn.)	NOC	0	4	0	3	2	9	08JUL–12AUG
Baileya levitans (Sm.)	NOC	4	3	0	2	0	9	13MAY–26JUL
Hyppa xylinoides (Gn.)	NOC	1	1	0	7	0	9	21MAY–09AUG
Xanthotype urticaria Swett	GEO	1	1	1	4	1	8	28MAY–09AUG
Xanthotype sospeta (Drury)	GEO	1	3	0	0	4	8	30MAY–17JUN
Antepione thisoaria (Gn.)	GEO	2	4	2	0	0	8	13MAY–06AUG
Eulithis explanata (Wlk.)	GEO	3	3	1	1	0	8	17JUN–20JUL
Horisme intestinata (Gn.)	GEO	2	0	1	3	2	8	24MAY–06AUG
Phyllodesma americana (Harr.)	LAS	2	4	0	1	1	8	01MAY–23MAY
Gluphisia septentrionis Wlk.	NOT	2	1	0	2	3	8	13MAY–06AUG
Lascoria ambigualis Wlk.	NOC	0	5	0	2	1	8	13MAY–02AUG
Allotria elonympha (Hbn.)	NOC	1	2	1	4	0	8	07JUN–26JUL
Acronicta retardata (Wlk.)	NOC	6	1	0	1	0	8	03JUN–12JUL
Cosmia calami (Harv.)	NOC	0	1	1	2	4	8	11JUL–03AUG
Furcula borealis (Guer.-Meneville)	NOT	2	2	0	1	2	7	01MAY–24MAY
Euchaetes egle (Drury)	ARC	1	3	0	0	3	7	10JUN–25JUL
Idia lubricalis (Gey.)	NOC	3	0	2	1	1	7	02JUL–02AUG
Bomolocha madefactalis (Gn.)	NOC	7	0	0	0	0	7	14MAY–06AUG
Meganola spodia Franclemont	NOC	0	7	0	0	0	7	17JUN–15JUL
Acronicta pruni Harr.	NOC	4	3	0	0	0	7	14MAY–24JUN
Acronicta caesarea Sm.	NOC	0	5	0	0	2	7	01JUL–04JUL
Nedra ramosula (Gn.)	NOC	0	2	0	5	0	7	10MAY–13MAY
Elaphria versicolor (Grt.)	NOC	4	0	0	3	0	7	14JUN–23JUL
Oreta rosea (Wlk.)	DRE	0	2	0	2	2	6	28MAY–01AUG

continued

Species	Family*	1990	1991	1992	1993	1994	Total	Inclusive Flight Range
Melanolophia signataria (Wlk.)	GEO	0	6	0	0	0	6	01MAY–15JUL
Metarranthis duaria (Gn.)	GEO	0	6	0	0	0	6	20MAY–28MAY
Venusia cambrica Curt.	GEO	3	3	0	0	0	6	06MAY–11JUN
Datana ministra (Drury)	NOT	3	2	0	1	0	6	17JUN–30JUL
Haploa confusa (Lyman)	ARC	0	0	0	6	0	6	19JUL–26JUL
Holomelina opella (Grt.)	ARC	3	1	1	1	0	6	28MAY–28JUN
Lithacodia concinnimacula (Gn.)	NOC	3	1	1	1	0	6	17MAY–08JUN
Protorthodes oviduca (Gn.)	NOC	0	3	1	2	0	6	28MAY–07JUN
Euchlaena irraria (B. & McD.)	GEO	0	5	0	0	0	5	01JUL–01JUL
Zanclognatha jacchusalis (Wlk.)	NOC	0	5	0	0	0	5	03JUN–01JUL
Phoberia atomaris Hbn.	NOC	0	1	2	2	0	5	01MAY–11MAY
Zale lunata (Drury)	NOC	0	5	0	0	0	5	13MAY–15JUL
Caenurgina erechtea (Cram.)	NOC	1	0	0	0	4	5	04JUL–13AUG
Catocala neogama (J.E. Smith)	NOC	0	5	0	0	0	5	12AUG–12AUG
Melanchra adjuncta (Gn.)	NOC	0	0	0	0	5	5	13JUN–27JUN
Spaelotis clandestina (Harr.)	NOC	0	0	2	2	1	5	20JUN–27JUL
Eueretagrotis perattenta (Grt.)	NOC	3	1	0	1	0	5	08JUL–23JUL
Pyrrhia umbra (Hufn.)	NOC	0	0	0	3	2	5	21JUN–25JUL
Semiothisa granitata (Gn.)	GEO	2	1	0	0	1	4	14MAY–01AUG
Eufidonia notataria (Wlk.)	GEO	0	1	0	0	3	4	13MAY–30MAY
Euchlaena serrata (Drury)	GEO	0	1	1	1	1	4	03JUN–06JUL
Euchlaena pectinaria (D. & S.)	GEO	0	0	4	0	0	4	15JUN–29JUN
Tolype notialis Franc.	LAS	0	0	0	2	2	4	01AUG–09AUG
Clostera inclusa (Hbn.)	NOT	0	1	1	1	1	4	10MAY–13JUN
Spilosoma virginica (F.)	ARC	1	1	0	2	0	4	28MAY–13AUG
Palthis asopialis (Gn.)	NOC	2	2	0	0	0	4	11JUN–13AUG
Catocala retecta Grt.	NOC	0	1	0	1	2	4	26JUL–12AUG
Catocala andromedae Gn.	NOC	1	2	0	1	0	4	22JUL–13AUG
Baileya dormitans (Gn.)	NOC	0	2	0	0	2	4	30MAY–01AUG
Lithacodia musta (G. & R.)	NOC	4	0	0	0	0	4	09JUL–30JUL
Leuconycta diphteroides (Gn.)	NOC	1	1	0	0	2	4	28MAY–16JUL
Oligia crytora (Franc.)	NOC	0	4	0	0	0	4	10JUN–24JUN
Lacinipolia lorea (Gn.)	NOC	1	2	0	0	1	4	03JUN–09JUL
Hydriomena pluviata (Gn.)	GEO	0	0	3	0	0	3	11MAY–11MAY
Pheosia rimosa Pack.	NOT	1	0	0	1	1	3	24MAY–08AUG
Schizura leptinoides (Grt.)	NOT	3	0	0	0	0	3	18JUN–16JUL
Cisseps fulvicollis (Hbn.)	ARC	0	3	0	0	0	3	01JUL–08JUL
Phalaenostola metonalis (Wlk.)	NOC	0	3	0	0	0	3	13MAY–13MAY
Bomolocha abalienalis (Wlk.)	NOC	3	0	0	0	0	3	09JUL–16JUL
Catocala sordida Grt.	NOC	0	0	1	0	2	3	18JUL–10AUG
Allagrapha aerea (Hbn.)	NOC	1	2	0	0	0	3	10JUN–18JUN

continued

*GEO=Geometridae, ARC=Arctiidae, NOT=Notodontidae, LAS=Lasiocampidae, DRE=Drepanidae, NOC=Noctuidae, SAT=Saturniidae, SPH=Sphingidae, LYM=Lymantriidae, EPT=Epiplemidae, THY=Thyatiridae, APA=Apatelodidae, MIM=Mimallonidae

Species	Family*	1990	1991	1992	1993	1994	Total	Inclusive Flight Range
Marathyssa basalis Wlk.	NOC	0	2	0	1	0	3	10MAY–13MAY
Acronicta lobeliae Gn.	NOC	1	0	0	2	0	3	17MAY–04JUN
Polia imbrifera (Gn.)	NOC	1	2	0	0	0	3	24JUN–09JUL
Semiothisa minorata (Pack.)	GEO	1	0	0	1	0	2	09JUL–09AUG
Eusarca confusaria Hbn.	GEO	0	1	0	1	0	2	08JUL–12JUL
Nemoria lixaria (Gn.)	GEO	1	0	1	0	0	2	16JUL–20JUL
Nemoria mimosaria (Gn.)	GEO	2	0	0	0	0	2	21MAY–21MAY
Venusia comptaria (Wlk.)	GEO	0	2	0	0	0	2	01MAY–01MAY
Schizura unicornis (J.E. Smith)	NOT	2	0	0	0	0	2	18JUN–18JUN
Haploa clymene (Brown)	ARC	1	0	0	1	0	2	26JUL–30JUL
Ecpantheria scribonia (Stoll)	ARC	0	2	0	0	0	2	17JUN–17JUN
Cycnia tenera Hbn.	ARC	0	1	1	0	0	2	17JUN–29JUN
Bleptina caradrinalis Gn.	NOC	0	2	0	0	0	2	17JUN–17JUN
Bomolocha bijugalis (Wlk.)	NOC	1	1	0	0	0	2	03JUN–06AUG
Zale undularis (Drury)	NOC	0	1	0	0	1	2	13MAY–06JUN
Catocala cerogama Gn.	NOC	1	1	0	0	0	2	18JUN–12AUG
Paectes oculatrix (Gn.)	NOC	0	0	0	2	0	2	07JUN–09AUG
Oruza albocostaliata (Pack.)	NOC	0	1	0	0	1	2	24JUN–01AUG
Acronicta funeralis G. & R.	NOC	0	0	0	2	0	2	21JUN–28JUN
Amphipoea velata (Wlk.)	NOC	0	1	1	0	0	2	06JUL–22JUL
Galgula partita Gn.	NOC	0	1	0	1	0	2	24JUN–19JUL
Polia goodelli (Grt.)	NOC	0	2	0	0	0	2	08JUL–22JUL
Leucania phragmatidicola Gn.	NOC	0	1	0	0	1	2	17JUN–20JUN
Ulolonche culea (Gn.)	NOC	0	0	0	0	2	2	30MAY–30MAY
Xestia normaniana (Grt.)	NOC	1	1	0	0	0	2	12AUG–13AUG
Anaplectoides prasina (D. & S.)	NOC	2	0	0	0	0	2	06AUG–13AUG
Heptagrotis phyllophora (Grt.)	NOC	0	1	0	1	0	2	17JUN–12JUL
Pyrrhia exprimens (Wlk.)	NOC	1	0	1	0	0	2	09JUL–03AUG
Cleora sublunaria (Gn.)	GEO	1	0	0	0	0	1	14MAY–14MAY
Selenia kentaria (G. & R.)	GEO	0	0	0	1	0	1	07JUN–07JUN
Cyclophora packardi (Prout)	GEO	0	0	0	1	0	1	09AUG–09AUG
Dysstroma truncata (Hufn.)	GEO	0	0	1	0	0	1	06JUL–06JUL
Mesoleuca ruficillata (Gn.)	GEO	0	0	1	0	0	1	10AUG–10AUG
Anticlea multiferata (Wlk.)	GEO	0	0	0	1	0	1	10MAY–10MAY
Xanthorhoe labradorensis (Pack.)	GEO	0	0	0	1	0	1	10MAY–10MAY
Lacosoma chiridota Grt.	MIM	0	0	0	0	1	1	20JUN–20JUN
Ceratomia amyntor (Geyer)	SPH	0	0	0	0	1	1	20JUN–20JUN
Paonias astylus (Drury)	SPH	0	0	0	1	0	1	19JUL–19JUL
Clostera albosigma Fitch	NOT	0	0	1	0	0	1	08JUN–08JUN
Schizura concinna (J.E. Smith)	NOT	0	0	0	0	1	1	27JUN–27JUN
Zanclognatha cruralis (Gn.)	NOC	0	0	0	1	0	1	24MAY–24MAY
Rivula propinqualis Gn.	NOC	0	1	0	0	0	1	28MAY–28MAY
Metalectra discalis (Grt.)	NOC	0	1	0	0	0	1	10JUN–10JUN
Panopoda carneicosta Gn.	NOC	0	0	0	0	1	1	11JUL–11JUL
Celiptera frustulum Gn.	NOC	0	1	0	0	0	1	05AUG–05AUG

continued

Species	Family*	1990	1991	1992	1993	1994	Total	Inclusive Flight Range
Catocala habilis Grt.	NOC	1	0	0	0	0	1	13AUG–13AUG
Catocala obscura Stkr.	NOC	0	0	0	0	1	1	08AUG–08AUG
Catocala residua Grt.	NOC	1	0	0	0	0	1	13AUG–13AUG
Catocala palaeogama Gn.	NOC	0	0	0	0	1	1	01AUG–01AUG
Catocala relicta Wlk.	NOC	1	0	0	0	0	1	06AUG–06AUG
Catocala crataegi Saund.	NOC	1	0	0	0	0	1	09JUL–09JUL
Abrostola ovalis Gn.	NOC	1	0	0	0	0	1	21MAY–21MAY
Diachrysia aeroides (Grt.)	NOC	1	0	0	0	0	1	16JUL–16JUL
Chrysanympha formosa (Grt.)	NOC	0	0	0	0	1	1	04JUL–04JUL
Syngrapha rectangula (W. Kby.)	NOC	0	0	1	0	0	1	06JUL–06JUL
Panthea furcilla (Pack.)	NOC	0	1	0	0	0	1	08JUL–08JUL
Agriopodes fallax (H.-S.)	NOC	0	1	0	0	0	1	08JUL–08JUL
Agriopodes teratophora (H.-S.)	NOC	0	1	0	0	0	1	17JUN–17JUN
Apamea cariosa (Gn.)	NOC	0	1	0	0	0	1	10JUN–10JUN
Oligia fractilinea (Grt.)	NOC	0	1	0	0	0	1	12AUG–12AUG
Iodopepla u–album (Gn.)	NOC	0	1	0	0	0	1	22JUL–22JUL
Phlogophora periculosa Gn.	NOC	0	1	0	0	0	1	12AUG–12AUG
Ipimorpha pleonectusa Grt.	NOC	1	0	0	0	0	1	13AUG–13AUG
Callopistria cordata (Ljungh)	NOC	1	0	0	0	0	1	18JUN–18JUN
Elaphria grata Hbn.	NOC	0	1	0	0	0	1	10JUN–10JUN
Ogdoconta cinereola (Gn.)	NOC	1	0	0	0	0	1	13AUG–13AUG
Lithophane querquera Grt.	NOC	1	0	0	0	0	1	14MAY–14MAY
Lithophane antennata (Wlk.)	NOC	0	0	0	1	0	1	10MAY–10MAY
Pyreferra hesperidago (Gn.)	NOC	0	0	1	0	0	1	11MAY–11MAY
Eupsilia vinulenta (Grt.)	NOC	0	0	1	0	0	1	11MAY–11MAY
Eupsilia sidus (Gn.)	NOC	0	1	0	0	0	1	01MAY–01MAY
Psaphida resumens Wlk.	NOC	0	1	0	0	0	1	01MAY–01MAY
Copivaleria grotei (Morr.)	NOC	0	1	0	0	0	1	13MAY–13MAY
Leucania ursula (Fbs.)	NOC	1	0	0	0	0	1	30JUL–30JUL
Orthosia revicta (Morr.)	NOC	0	0	0	1	0	1	10MAY–10MAY
Morrisonia evicta (Grt.)	NOC	1	0	0	0	0	1	21MAY–21MAY
Tricholita signata (Wlk.)	NOC	0	0	1	0	0	1	10AUG–10AUG
Peridroma saucia (Hbn.)	NOC	0	1	0	0	0	1	10JUN–10JUN
Xestia bicarnea (Gn.)	NOC	0	1	0	0	0	1	12AUG–12AUG
Euretagrotis attenta (Grt.)	NOC	1	0	0	0	0	1	16JUL–16JUL

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